EPTAM USE IN SUGARCANE: INCORPORATION METHODS, WEED CONTROL, AND CROP TOLERANCE

J. Mite, J.L. Griffin, and J.M. Boudreaux
School of Plant, Environmental, and Soil Sciences

In 2008 Eptam (EPTC) was labeled for use in fallow ground and research was initiated to investigate potential use of Eptam during the fallow period in a sugarcane production system. In sugarcane because row tops are not disturbed over the multi-year crop cycle, perennial weeds including johnsongrass, bermudagrass, and nutsedges can become problematic. During the fallow year, fields are prepared for replanting and weed control programs are implemented to reduce infestations of perennial weeds. Glyphosate is used extensively in fallowed sugarcane fields, but is not highly effective on bermudagrass and nutsedges. Research was conducted over three years to evaluate Eptam at 2, 3, 4, and 5 pints/A incorporated on pre-formed sugarcane beds using a Lilliston® rolling cultivator or a hipper/bedder. The rolling cultivator was equipped with six gangs per bed and was set to incorporate herbicide 2 to 3 inches deep. The hipper/bedder was equipped with a sweep centered on the row top that opened the bed followed by 3-disk gangs that re-hipped in a single operation. All Eptam treatments were followed by Roundup OriginalMax (glyphosate) and weed control was compared to that of Roundup OriginalMax applied once or twice.

Experiments were conducted in fields with moderate to heavy infestations of bermudagrass, johnsongrass, and nutsedge. For all weeds, differences in control among Eptam rates and between incorporation methods were generally not observed. For bermudagrass 30 days after treatment (DAT), ground cover was 7 to 18% where Eptam was applied and was less than for the nontreated (29% ground cover) (Table 1). Two weeks later, bermudagrass ground cover for the Eptam treatments was 13 to 28% compared with 6% ground cover where Roundup OriginalMax was applied 14 d earlier. By 60 DAT, bermudagrass ground cover was equal and no more than 6% where Eptam was followed by Roundup OriginalMax and where only Roundup OriginalMax was applied twice. Johnsongrass was controlled 57 to 69% 30 DAT regardless of Eptam rate or application method (data not shown). By 45 DAT, johnsongrass control was equal (89 to 97%) where Eptam was followed by Roundup OriginalMax and where only Roundup OriginalMax was applied. Nutsedge (purple and yellow combined) was controlled 29 to 50% 30 DAT regardless of Eptam rate or application method (Table 2). By 45 DAT, nutsedge control was equal (39 to 51%) where Eptam was followed by Roundup OriginalMax and where Roundup OriginalMax was applied twice (48%).

In another study, crop response was evaluated when Eptam was applied at 3, 5, and 7 pints/A and incorporated with a rolling cultivator immediately after sugarcane was planted in September. Sugarcane shoot population in late October and in February of the following year was not negatively affected by Eptam when compared to the Prowl plus Sencor standard applied to the soil surface at planting (data not shown). Eptam at 7 pt/A controlled sowthistle, white clover, Italian ryegrass, and winter annual bluegrass 0, 58, 65, and 61%, respectively, compared with 75, 100, 97, and 100%, respectively, for Prowl plus Sencor.

Although Eptam can be used safely in sugarcane, bermudagrass, johnsongrass, and nutsedge were not effectively controlled with Eptam applied alone during the fallow period. Perennial weed control was no greater when Roundup OriginalMax was applied following Eptam than when only Roundup OriginalMax was applied. Using a price of $45.10/gallon for Eptam, cost of 3.5 pt/A (lowest labeled rate) would be $19.73 (Table 3). The cost for one application of generic glyphosate at 32 oz/A ($11.00 per gallon) and of Roundup OriginalMax at 23 oz/A ($36.00 per gallon) would be $2.75 and $6.47/A, respectively. This would bring the total weed control cost where Eptam is followed by glyphosate to $22.48 or $26.20/A, depending on formulation. This compares with $5.50 or $12.94/A where the glyphosate products are applied twice. Use of Eptam may reduce number of tillage operations for weed control, conserve soil moisture, and reduce fuel cost. The value of Eptam as a component of fallow weed control programs would be directly dependent on economics and grower preferences.

Table 1. Bermudagrass ground cover 30, 45, and 60 days after treatment (DAT) with Eptam as affected by incorporation using a hipper/bedder and a Lilliston® rolling cultivator and followed by (fb) Roundup Original Max as compared with Roundup Original Max applied alone.[1]

Treatments	Rate	Application timing	30 DAT[2] Hipper bedder	30 DAT[2] Rolling cultivator	45 DAT[3] Hipper bedder	45 DAT[3] Rolling cultivator	60 DAT[3] Hipper bedder	60 DAT[3] Rolling cultivator
	Product/A		---------------------% Bermudagrass ground cover-------------------------					
Eptam fb Roundup OM	2 pt 23 oz	PREI LPOST	18 b[4]	13 bcd	26 ab	17 bc	6 a	4 bcd
Eptam fb Roundup OM	3 pt 23 oz	PREI LPOST	17 b	14 bc	26 ab	18 bc	6 a	3 cd
Eptam fb Roundup OM	4 pt 23 oz	PREI LPOST	18 b	10 cd	28 a	16 c	5 abcd	4 bcd
Eptam fb Roundup OM	5 pt 23 oz	PREI LPOST	13 bcd	7 d	18 bc	13 cd	5 abcd	3 cd
Roundup OM fb Roundup OM	23 oz 23 oz	EPOST LPOST	29 a		6 d		5 abcd	

[1]Eptam applied preemergence and incorporated (PREI) on May 10, 2007; June 11, 2008; and May 29, 2009 at St. Gabriel, LA. Roundup OriginalMax was applied early postemergence (EPOST) on July 9, 2007; July 14, 2008; and July 29, 2009 and late postemergence (LPOST) on July 24, 2007; July 28, 2008; and July 22, 2009.
[2] Roundup OriginalMax had not been applied at the 30 DAT rating.
[3]At the 45 DAT rating, Roundup OriginalMax was applied EPOST 15 days earlier. At the 60 DAT rating, Roundup OriginalMax was applied EPOST 30 days earlier and LPOST 15 days earlier.
[4]For each rating date means followed by the same letter are not significantly different ($P \leq 0.05$).

Table 2. Nutsedge control 30 and 45 days after treatment (DAT) with Eptam as affected by incorporation using a hipper/bedder and a Lilliston® rolling cultivator and followed by (fb) Roundup Original Max as compared with Roundup Original Max applied alone.[1]

Treatments	Rate Prod/A	Application timing	30 DAT[2] Hipper bedder	30 DAT[2] Rolling cultivator	45 DAT[2] Hipper bedder	45 DAT[2] Rolling cultivator
	Product/A		------------% Bermudagrass ground cover------------			
Eptam fb Roundup OM	2 pt 23 oz	PREI EPOST	34 b[3]	35 ab	51 a	42 ab
Eptam fb Roundup OM	3 pt 23 oz	PREI EPOST	36 ab	29 b	39 ab	39 ab
Eptam fb Roundup OM	4 pt 23 oz	PREI EPOST	44 ab	31 b	51 a	39 ab
Eptam fb Roundup OM	5 pt 23 oz	PREI EPOST	43 ab	50 a	44 ab	41 ab
Roundup OM fb	23 oz	EPOST	0 c		48 ab	

[1]Eptam applied preemergence and incorporated (PREI) on May 10, 2007; June 11, 2008; June 11, 2008; and May 29, 2009 at St. Gabriel, LA. Roundup OriginalMax was applied early postemergence (EPOST) on July 9, 2007; July 14, 2008; and July 29, 2009 and late postemergence (LPOST) on July 24, 2007; July 28, 2008; and July 22, 2009.
[2]Roundup OriginalMax had not been applied at the 30 DAT rating. At the 45 DAT rating, Roundup OriginalMax was applied EPOST 15 days earlier.
[3]For each rating date means followed by the same letter are not significantly different ($P \leq 0.05$).

Table 3. Cost comparisons for Eptam followed by generic glyphosate or Roundup OriginalMax weed control programs.[1]

Eptam 3.5 pt/A		Generic Roundup 32 oz/A		Roundup OriginalMax 23 oz/A	Total cost/A
$19.73	+	$2.75	**or**	$6.47	$22.48 **or** $26.20
0		$2.75 + $2.75	**or**	$6.47 + $6.47	$5.50 **or** $12.94
$19.73	+	$2.75 + $2.76	**or**	$6.47 + $6.48	$25.23 **or** $32.67

[1]Herbicide costs: Eptam @ $45.10/gallon; Generic glyphosate @ $11.00/gallon and; Roundup OriginalMax @ $36.00/gallon. Costs of the treatments will vary depending on herbicide cost.

INVESTIGATION OF FACTORS AFFECTING SUSPENSION OF METRIBUZIN DF IN SPRAY SOLUTION

A.J. Orgeron, J.L. Griffin, and J.M. Boudreaux
School of Plant, Environmental, and Soil Sciences

In recent years sugarcane producers have reported problems with the metribuzin DF (dry flowable) formulation related to mixing and clogging of main filter and nozzle screens. When a DF formulation is added to water in the spray tank, particles should completely wet, fall apart, and disperse in the spray solution. Any factor affecting ability of DF metribuzin to wet and disperse can result in formation of sediment which contributes to spray problems. Analysis of five water sources where problems have occurred showed ranges of 7.5 to 8.3 pH, 127 to 508 alkalinity, and 46 to 120 hardness (Ca and Mg). Research was conducted in the laboratory to investigate various factors including water source, metribuzin product, agitation time, spray volume, and addition of surfactant or another herbicide that may contribute to the sediment problem. In all experiments, water sources from the Carmouche Farm in Assumption Parish where serious mixing problems have occurred (8.3 pH, 366 alkalinity, and 46 hardness) and from St. Gabriel municipal water (7.8 pH, 181 alkalinity, and 4 hardness) were used. Formulated metribuzin products were added to water to correspond to a field rate of 2 lbs product per acre applied in 10, 15, or 20 gallons per acre spray volume equivalent. Erlenmeyer flasks containing water and herbicide were agitated using a shaker for 15, 30, 60, or 90 minutes and spray solution was filtered through Whatman #1 (11 micron) filter paper. Collected sediment was dried and weighed.

For Sencor, sediment was equal using the Carmouche and St. Gabriel water sources but with Tricor, sediment was greater for the Carmouche water source (Table 1). In most cases sediment was greater for Sencor than for TriCor regardless of water source. Differences in water sources may be related to alkalinity and hard water. Sediment was reduced when agitation time increased and when spray volume equivalent increased. At a spray volume equivalent of 15 gallons per acre, collected sediment was greater when Sencor or TriCor was used in combination with crop oil concentrate compared with nonionic surfactant or with no surfactant. For both the Carmouche and St. Gabriel water sources, sediment was greater when Sencor or TriCor was applied with Brash® (dicamba plus 2,4-D) compared with metribuzin applied alone.

Laboratory research is underway to evaluate addition of buffer and ammonium sulfate to mitigate the negative effect of water pH, alkalinity, and hardness on suspension of metribuzin DF. Research will also evaluate the various factors using grower spray equipment. It appears from this research that both spray volume and agitation of DF metribuzin formulation are extremely critical. If possible, a slurry should be made in a pre-mixing tank with thorough agitation before spray solution is pumped into the tractor tank.

Table 1. Percent metribuzin sediment as affected by water source, metribuzin formulation, agitation time, spray volume equivalent, and addition of surfactant or Brash herbicide.

--------Water source/Metribuzin formulation (Experiment 1) / Sediment (%) ------------	
Carmouche/Sencor	72.7 a
St. Gabriel/Sencor	71.7 a
Carmouche/TriCor	69.3 b
St. Gabriel/TriCor	63.6 c

--------Water source/Metribuzin formulation (Experiment 2) / Sediment (%) ------------	
Carmouche/Sencor	76.7 a
St. Gabriel/Sencor	75.3 ab
Carmouche/TriCor	73.0 b
St. Gabriel/TriCor	67.6 c

---------------------Agitation time (minutes) / Sediment (%) --------------------------------	
15	71.3 a
30	69.4 a
60	69.3 ab
90	67.3 b

---------------------Spray volume equivalent (GPA) / Sediment (%) ------------------------	
10	76.8 a
15	73.1 b
20	69.6 c

--------------------Metribuzin formulation/Surfactant) / Sediment (%) ----------------------	
Sencor/crop oil concentrate	100 a
TriCor/crop oil concentrate	97.5 b
Sencor/nonionic surfactant	75.1 c
TriCor/nonionic surfactant	67.5 d
Sencor/no surfactant	73.0 c
TriCor/no surfactant	67.9 d

-------------------Water source/Brash addition) / Sediment (%) -----------------------------	
Carmouche + Brash	93.9 a
Carmouche - Brash	82.8 b
St. Gabriel + Brash	79.5 b
St. Gabriel - Brash	74.6 c

NUTSEDGE CONTROL IN SUGARCANE AT PLANTING AND IN SPRING

J.L. Griffin, L.M. Etheredge, Jr., and J.M. Boudreaux
School of Plant, Environmental, and Soil Sciences

Field studies were conducted to evaluate control of purple and yellow nutsedge in sugarcane with herbicides applied preemergence at planting in August or September, postemergence in September or October (prior to the winter dormant period), or postemergence in March (after the winter dormant period). In the first study, herbicides were applied either immediately after sugarcane was planted or when nutsedge was 6 to 10 inches and sugarcane was 14 to 18 inches. By 10 weeks after treatment (WAT), nutsedge (purple and yellow combined) was controlled preemergence 31 to 43% with Spartan 4F at 8, 10, and 12 oz/A and Permit 75 DF at 2/3, 1, and 1⅓ oz/A (Table 1). When herbicides were applied postemergence in October, Permit at 1 and 1⅓ oz/A controlled nutsedge 74 and 79% 3 WAT, respectively, and control was greater than for all rates of Spartan. At one location, nutsedge control in April of the following year was 73 to 80% with Spartan at 12 oz/A and Permit at 2/3, 1, and 1⅓ oz/A applied postemeergence in October of the previous year.

In a second study, herbicides were applied postemergence 35 days after planting in September when nutsedge was 4 to 6 inches and sugarcane was 8 to 10 inches. Nutsedge control 6 WAT with Permit applied alone at 1 or 1⅓ oz/A or with 2,4-D or Yukon applied at 8 or 12 oz/A was equivalent and averaged 77% (Table 2). Control 6 WAT with Envoke alone at 0.2 and 0.3 oz/A or with 2,4-D averaged 68%. In March of the following year when sugarcane emerged after the winter dormant period, nutsedge control with Permit applied alone or with 2,4-D or Yukon at one location averaged 74% compared with an average of 44% for the Envoke treatments. Differences in nutsedge control were not reflected in higher early season sugarcane shoot population or in late season stalk height and population.

In a third study, Permit and Envoke treatments were applied postemergence in March after sugarcane (10 to 12 inches) and nutsedge (2 to 4 inches) had emerged from the winter dormant period. At 5 WAT nutsedge control averaged 79% for Permit at 1 and 1⅓ oz/A and for Envoke at 0.3 oz/A (data not shown). Sugarcane height in May and July and stalk population in July where nutsedge was controlled as much as 79% were no greater than for the nontreated. In regard to sugarcane injury, significant foliar discoloration and stunting were observed 2 to 3 WAT where Spartan or Envoke was applied postemergence but sugarcane growth later in the growing season was not affected. Permit did not injure sugarcane.

Nutsedge control programs in sugarcane should be first implemented during the fallow period using glyphosate programs to help reduce the nutsedge tuber population and to prevent weeds from removing moisture from the seedbeds and causing problems in opening of rows and in covering of planted sugarcane. Multiple applications of glyphosate during the fallow period have not been effective in controlling nutsedge. Standard herbicides used in sugarcane and applied to the soil at planting are mostly ineffective on nutsedge. In this study, Spartan and Permit applied preemergence controlled nutsedge no more than 43% 10 WAT and control was no greater than for the hexazinone plus diuron standard.

Other control alternatives for nutsedge would be to apply herbicide in the fall after nutsedge and sugarcane have emerged after planting or to wait until the following spring after nutsedge and sugarcane emerge from the winter dormant period. When Spartan and Permit were applied postemergence in the fall to 6 inch nutsedge, control the following April was around 60% for Spartan and around 80% for Permit, greater than when the herbicides were applied preemergence at planting (around 50% control). Envoke applied postemergence in the fall controlled nutsedge around 68% 6 WAT compared with around 76% for Permit. By March of the following year nutsedge control with Permit had not changed appreciably compared with 6 WAT, but control with Envoke had decreased to around 44%.

A reduction in the ability of nutsedge to reestablish a significant underground tuber population in the fall will allow sugarcane to establish a stable root system. This will help sustain sugarcane plants through the wet and cool winter dormant period and will promote development of buds that will affect shoot emergence in the spring. When Permit and Envoke were applied in the spring, nutsedge control was around 80%. 2,4-D ester controlled nutsedge no more than 36%. Even though differences in control were observed, sugarcane emerging from the winter dormant period was able to compete with nutsedge and sugarcane growth was not affected.

Table 1. Nutsedge control and sugarcane injury following herbicides applied preemergence at sugarcane planting in August or September and postemergence in October.[1]

Treatment[2]	Rate	Nutsedge control[3]					Sugarcane injury[3]
		Preemergence			Postemergence		Postemergence
		7 WAT	10 WAT	April 2005	3 WAT	April 2005	3 WAT
	Product/A	--------------------	--------------------	--------------------	%	--------------------	--------------------
Spartan 4F	8 oz	46 c[4]	33 ab	50 def	54 d	65 bc	19 a
Spartan 4F	10 oz	52 c	43 a	55 cde	50 d	58 cde	18 a
Spartan 4F	12 oz	47 c	38 ab	43 f	61 cd	79 a	21 a
Permit 75DF	2/3 oz	64 ab	31 b	53 def	65 bc	80 a	0 b
Permit 75DF	1 oz	55 bc	37 ab	48 ef	74 ab	73 ab	0 b
Permit 75DF	1⅓ oz	72 a	38 ab	61 bcd	79 a	78 a	0 b
DuPont K4	4 lb	51 c	29 b	60 cd	-	-	-
Nontreated	-	0 d	0 c	0 g	0 e	0 g	0 b

[1] Preemergence applications were made August 27 and September 15, 2004 the day after sugarcane was planted at St. James and Whitecastle, LA, respectively. Postemergence applications were made October 19 and 26, 2004, respectively, when yellow and purple nutsedge were 6 to 10 inches tall and sugarcane was 14 to 18 inches. Postemergence herbicide treatments were applied with a nonionic surfactant at 0.25% v/v. WAT = weeks after treatment.

[2] Prowl at 2 qt/A was applied at planting across the entire experimental area except where the DuPont K4 treatment was applied.

[3] Data for nutsedge (purple and yellow together) and sugarcane represent an average across two locations with the exception of the April 2005 nutsedge control ratings which represent only the Whitecastle, LA location.

[4] Treatment means within columns followed by the same letter are not significantly different according to the *t* test on least square means at P=0.05. Nutsedge control means for April, 2005 can be compared for preemergence and postemergence treatments.

Table 2. Nutsedge control and sugarcane injury following herbicides applied postemergence in September in newly planted sugarcane.[1]

		Nutsedge control[3]				Sugarcane[3] Injury			Sugarcane[3] Shoot population
Treatment[2]	Rate	2 WAT	4 WAT	6 WAT	March 2006	2 WAT	4 WAT	6 WAT	March 2006[c]
	Product/A	----------------------%----------------------				---------------%-------------			1,000/ha
Permit 75DF	1 oz	40 ab[4]	79 ab	75 abc	78 a	4 b	3 b	0 a	19.1 a
Permit 75DF	1⅓ oz	44 a	81 a	78 ab	76 ab	1 bc	2 b	0 a	22.0 a
Permit 75DF + 2,4-D	1 oz + 26 oz	43 ab	81 a	76 ab	78 a	0 c	1 b	0 a	21.4 a
Yukon 67.5 DG	8 oz	39 b	80 a	75 abc	68 b	2 bc	4 b	0 a	19.8 a
Yukon 67.5 DG	12 oz	43 ab	80 a	79 a	71 ab	1 bc	4 b	0 a	19.9 a
Envoke 75DF	0.2 oz	39 b	73 c	64 d	43 c	30 a	13 a	1 a	19.4 a
Envoke 75DF	0.3 oz	41 ab	74 bc	68 cd	45 c	31 a	14 a	1 a	20.1 a
Envoke 75DF + 2,4-D	0.2 oz + 26 oz	43 ab	76 abc	71 bc	45 c	31 a	13 a	0 a	22.9 a
Nontreated	-	0 c	0 d	0 e	0 d	0 c	0 c	0 a	16.3 a

[1] Postemergence herbicide applications were made 5 weeks after sugarcane planting on September 9 and 12, 2005 at New Roads, LA, and Vacharie, LA, respectively, when nutsedge (yellow and purple combined) was 4 to 6 inches tall and sugarcane was 8 to 10 inches. All herbicides were applied with a surfactant at 0.25% v/v. WAT = weeks after treatment.
[2] 2,4-D formulation used was a low volatile ester.
[3] Data for nutsedge (purple and yellow nutsedge together) and sugarcane represent an average across two locations with the exception of the March 2006 nutsedge control ratings which represent only the New Roads, LA location.
[4] Treatment means within columns followed by the same letter are not significantly different according to the *t* test on least square means at P=0.05.